

CASE REPORT SUMMARY

SPECIES: Humpback Whale (*Megaptera novaeangliae*)

DATE: FIRST OBSERVED: April 6 2010

DATE EXAMINED: April 9 2010

CASE NUMBER: NY4236-10

Executive Summary.

On the morning of April 6, 2010, the local marine mammal stranding network organization reported a live 30 foot 13 ton juvenile humpback whale (*Megaptera novaeangliae*) beached in heavy surf in East Hampton, NY. Humpback whales are protected under both the Marine Mammal Protection Act (MMPA) and the Endangered Species Act (ESA) since they are listed as “endangered” under the ESA. A team of marine mammal stranding response and veterinary experts responded under the direction of NOAA and in consultation with a larger team of experts nationally. The team assessed the situation and determined that the size and mass of the whale, coupled with the environmental conditions at the time, prevented any type of intervention such as pushing or pulling the animal out to sea. After evaluating all the options the team determined the most humane and best course of action was to euthanize the whale. Over the course of several days, the team made arrangements to carry out humane euthanasia and a subsequent post mortem examination and carcass disposal. Based upon evaluation of all the facts such as the gross observations, histological evaluation of tissues, ancillary diagnostics, and environmental issues, no definitive cause of the stranding was determined.

Background.

Individual and mass strandings of cetaceans are common and have been attributed to such causes as infectious disease, biotoxin exposure, human caused activity (e.g. ship strike or fishing gear entanglement), or age-related mortality (e.g. “natural causes”). Often, however, the cause of stranding is not determined due to many factors including decomposition state of the animal carcass, logistical constraints for evaluations, or there is no apparent evidence of significant disease or injury upon examination. This whale was severely compromised by the stranding event so the team decided to humanely euthanize the whale to end its pain and suffering. The size and mass of the whale, coupled with the environmental conditions at the time and the failure of the animal to refloat during successive tidal cycles prevented any other type of intervention. Details about the event and case investigation are given in this report.

The NOAA’s National Marine Fisheries Service (NMFS) Marine Mammal Health and Stranding Response Program (MMHSRP) was created in 1992 through a statutory amendments to the MMPA. Through this, the NMFS MMHSRP is designated as the lead to coordinate response to stranded whales, dolphins, seals and sea lions and to investigate the causes of strandings. The MMHSRP partners with stranding networks throughout the United States to monitor for, respond to, and investigate stranding events. The MMHSRP holds a scientific research and enhancement permit under the MMPA and the ESA for stranding response and investigation (including sample and tissue collection) of endangered marine mammals, including large whale species (Permit No. 932-1905-MA-009526). More information on the MMHSRP can be found at: <http://www.nmfs.noaa.gov/pr/health/>.

As part of a stranding investigation, a standard set of information is collected including circumstances of the stranding event (e.g., location of stranding, environmental conditions, human activity, etc.), external and internal exam. The exam typically

includes a necropsy which is conducted by trained experts of the stranding network and includes an assessment of organs and body condition (gross necropsy) and collection of samples for microscopic evaluation (histopathology), life history information (morphometrics, age, genetics, contaminants), and ancillary diagnostics such as microbiology, virology, and toxicology (biotoxins, chemicals or anthropogenic pollutants).

Case Overview for Humpback Whale on Long Island (ID No. NY4236-10)

On the morning of April 6, 2010, the local NMFS authorized marine mammal stranding network organization reported a live humpback whale (*Megaptera novaeangliae*) beached in heavy surf in East Hampton, NY. Humpback whales are protected under both the MMPA and the ESA. Response efforts for this stranded humpback whale were conducted under Permit No. 932-1905-MA-009526 issued to NOAA. The size and mass of the whale, as well as the challenging environmental conditions on Long Island, prohibited rescue efforts and required that the whale be humanely euthanized to end its pain and suffering on the beach. An expert Response Team led by NMFS MMHSRP was assembled to evaluate the whale and to set a course of action. The Response Team evaluated several options including tide release, towing out to sea for release, humane euthanasia or natural death. In consultation with marine mammal veterinarians and biologists nationwide, the Team decided the only logistically feasible and humane option was euthanasia. In consultation with expert marine mammal veterinarians, biologists, and a veterinary pharmacologist, the Team administered a combination of pharmaceuticals and ballistics to sedate and subsequently euthanize the whale.

Euthanasia. The following single or combination of drugs and methods of administration were utilized for euthanasia:

1. Midazolam at 0.2mg/kg IM/Butorphanol at 0.2mg/kg IM. (7th April 2010).
2. Butorphanol 6000 mg IM. (8th of April 2010).
3. Beuthanasia-D 600ml IP and 320 ml IV (retrobulbar plexus) after 3 pericranial .577 ballistic rounds. (9th April 2010).

On April 9, 2010 at 11:45AM, the whale expired and an expert team of experienced large whale biologists and veterinary pathologists conducted a necropsy over a 5.5 hour period. Numerous samples were collected for scientific analysis and the carcass remains were transported from the beach site by the Town of East Hampton Sanitation Department and the beach was cleaned by the necropsy team as directed by Long Island officials.

External Exam.

The humpback whale was a juvenile (1-2 year old) male that was over 30 feet long and weighed around 13 tons (more than 26,000 pounds), which is the approximate size and weight of a large passenger city bus. It was in good body condition based upon the subcutaneous and visceral adipose and musculature. The sites of pharmaceutical injection by dart were evident and extended into the blubber and muscle. In addition, the site of ballistic entry on the right side was present.

Internal Exam.

A large accumulation of adipose was present within the thoracic cavity which covered the heart and partially compressed the right and left lung lobes. Fluid but little solid material was present in the intestine. Within and around (retroperitoneal) the kidneys, there were round worms with associated tissue reaction (i.e., granuloma). Near the site of the ballistic entry, the right ear was fractured and in the underlying brain, there was focal, subdural hemorrhage. There was discoloration, focally, of the abdominal muscle.

Samples from all organs were collected and submitted for microscopic evaluation. Samples were also collected for virology, microbiology, chemical, and biotoxin analysis. The brain was collected *in toto* by Mount Sinai for radiographic study and subsampling of the brain was conducted for microscopic evaluation.

Microscopic Findings

A total of 89 tissue samples and whole brain were submitted and examined by two board-certified veterinary pathologists, Drs. Dee McAloose (Wildlife Conservation Society) and David Rotstein (NOAA). The pathologists examined the same set of tissues through the generation of duplicate slides.

Microscopic findings of note include confirmation of the presence of granulomas in the kidney and retroperitoneal space. In addition, there was inflammation of the abdominal fat (mesentery), periureteral fat, and peripancreatic fat. In the liver, there were lipid (fat) vacuoles and glycogen (storage form of glucose) within hepatocytes. In the bronchioles of the lung, there were inflammatory cells, increased mucus, and occasional bacteria. There was focally extensive subdural hemorrhage in the occipital lobe thought to be secondary to ballistic impacts nearby. There was hemorrhage within the underlying cerebrum and perivascular hemorrhage throughout the brain. In the abdominal musculature, there was degeneration of collagen and myofibers. The right prescapular lymph node contained abundant blood.

Ancillary Diagnostics and Anthropogenic Evaluation

Environmental Data

Weather and tide patterns were normal.

Military Activity

NMFS MMHSRP requested information from the U.S. Navy about military activity in the vicinity around the time of the stranding. The Navy reported no active sonar within 100 nm and previous 72 hours. There were no reported ship strikes. The closest reported activity was a single unit approximately 197NM from the location of the stranding on the evening of April 4, 2010. The next closest was 3 units conducting Unit Level Training ~220NM of the stranding at various times from between March 31, 2010 to April 5, 2010.

Radiography

A computerized tomography scan (CT) was performed at Mount Sinai to evaluate the brain as part of an ongoing research project. The site of subdural hemorrhage observed at necropsy was present and extended into the associated cerebral sulcus.

Virology

Routine evaluation of morbillivirus infection was performed utilizing a "Universal" morbillivirus PCR at the Athens Veterinary Diagnostic Laboratory on July 7, 2010 and results showed no evidence of the virus in submitted tissues (Accession Number A110641).

Microbiology

Bacterial culture of select tissues was conducted by a private veterinary diagnostic laboratory, Antech Diagnostics. There were no microbiological isolates of concern found in this animal.

Urinalysis

An urinalysis which included evaluation of protein, glucose, specific gravity, blood, ketones and urine myoglobin was performed at the Texas Veterinary Medical Diagnostic Laboratory. The results were within normal limits for a cetacean and no urine myoglobin was found.

Complete Blood Count and Serum Chemistry Analysis

A complete blood count (CBC) and white blood cell count (WBC) were completed at a private veterinary diagnostic laboratory, Antech Diagnostics. Reference ranges for humpback whales have not been developed therefore evaluation of this case required comparison to values of other marine mammals, specifically small cetaceans. For this reason, an "increased" or "decreased" value should be considered based on an inter species comparison, be regarded with caution, and be qualitative at this time.

Based on comparisons with dolphin reference ranges, there were mild decreases in the following: red blood cell count, hematocrit, white blood cell count, serum phosphorus, and potassium. There was a mild increase in serum calcium. All other values were within the reference ranges of other cetaceans.

Steroids and Vitamins

Plasma testosterone was <40.0 pg/ml and Vitamin A was 50.0 ng/ml.

Parasitology

Renal parasites collected in necropsy were fixed in 100% ethanol. The parasites were submitted to Dr. Williams at the National Marine Life Center and to the Cornell University Animal Health Diagnostic Center. Both identified the parasites as a nematode, *Crassicauda boopsis*, a parasite frequently observed in the kidney and associated vasculature of large whales.

Biotoxins

Analyses for biotoxins (okadaic acid, saxitoxin, brevetoxin, and domoic acid) were conducted at the National Ocean Service, National Oceanic and Atmospheric Administration, Marine Biotoxin Program. Samples of bile, urine, stomach contents, and intestinal contents were negative for any of these biotoxins.

Summary of Findings

The immediate cause of death of this stranded cetacean was euthanasia resulting in cardiopulmonary collapse. Based upon gross observations, histological evaluation of tissues, environmental conditions, and ancillary diagnostics, a cause of stranding was not determined in this case. There was no evidence of infectious or inflammatory disease or biotoxigenesis. Individual and mass strandings of cetaceans are not uncommon in the coastal US. While, in some cases, strandings may be attributed to such causes as infectious processes, biotoxin exposure, anthropogenic activity, or age-related mortality (e.g. “natural causes”), in many cases, the cause of stranding cannot be explained as there is no evidence of significant disease or environmental changes.

There were findings of note in this case including the grossly observed mass of adipose in the thoracic cavity, renal endoparasitism, acute inflammation in the airways, focal subdural and parenchymal hemorrhage in the brain (likely a result of concussive forces from the ballistics), hepatic lipid and glycogen accumulation, and myofiber and collagen degeneration in the ventral abdominal musculature. These findings may be separated into chronic processes and acute-likely post-stranding related processes.

The fat body in the thoracic cavity was composed of mature adipocytes with no evidence of inflammation or necrosis of fat. Given that this animal was in good body condition, this fat body may be a normal anatomical feature. That said, in a beached stranded animal of this size and weight which places great pressure on the thoracic cavity, this fat body could affect cardiopulmonary function to some degree.

Glycogen, a storage form of glucose, was increased in the liver. This increased glycogen could reflect endogenous production of cortisol resulting in a “steroid hepatopathy”. This is a likely indicator of a stress response. Lipid was also present in hepatocytes which could reflect mobilization of fat stores in an animal that has not been eating. Gastric contents were minimal and while the animal did not eat while on the beach, it is not known whether feeding was inhibited immediately prior to stranding, but the good body condition suggests it had been feeding in recent weeks or months at least.

The focal subdural hemorrhage with extension into the superficial cerebrum as well as the fractured ear likely relate to the ballistic trauma, though other cases of an animal rolling the surface has shown head trauma including fractures. It is unlikely that the hemorrhages occurred prior to or early in the stranding as the cellular constituents of the hemorrhage was erythrocytes without evidence of clot formation or macrophages infiltrating the site of hemorrhage. This indicates that the hemorrhages occurred shortly before death or around the time of death.

The inflammation in the large airways in the lung likely occurred during the course of stranding reflecting decreased respiratory clearance in a compromised animal. Degeneration of muscle fibers and collagen are likely the result of pressure on the abdomen leading to localized damage.

In summary, the cause of the stranding was not determined based on histological examination of tissues, diagnostic testing, and environmental assessment.